THE MOTOR AGE

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LEADING CONTENTS

INFORMATION FOR FUTURE BUYERS—II.

CONTINUATION OF EDITORIAL COMMENT ON THE AUTOMOBILE AND THE INDUSTRY—THE DIFFERENT TYPES OF AUTOS DESCRIBED—THE PROBLEM OF WHEEL CONSTRUCTION—ADVANTAGES AND DISADVANTAGES OF ELECTRIC CARRIAGES POINTED OUT.

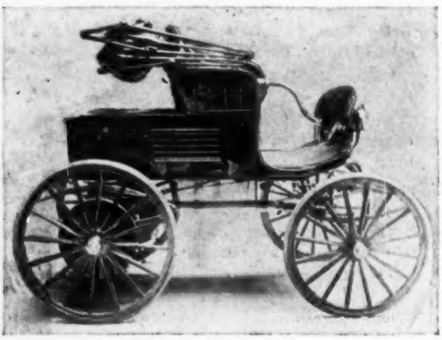
To make the reader understand the difference between the three different types of automobile construction, as he should understand it, it is necessary to explain it in a systematic, although not in a technical manner.

Broadly, automobiles are divided into two classes, those for carrying passengers and those for carrying merchandise and freight—private and public carriages, motor bicycles and motor tricycles in one class and delivery wagons and trucks in the other class. For the present attention will be confined to four wheeled passenger vehicles, as the demand for information is almost entirely directed towards this class. To still further narrow the subject attention will be given almost exclusively to private carriages—using the word "carriage" in the broadest sense consist-

ent with coupling it with the qualifying adjective "private."

Duties of the Driving Wheels

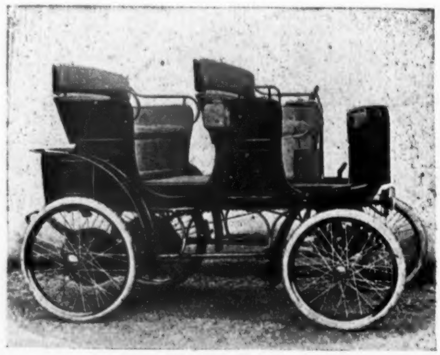
In addition to performing the double work of carrying the load and driving it, which is performed by two (usually, but not always two), of the wheels of an automobile, which will be more fully considered in connection with the discussion of electrical vehicles, there are other calls on these wheels. In going around a corner neither member of any one pair of wheels travels the same distance. If the pair of wheels thus affected are the wheels by which the automobile is driven, it will be seen—if both are driven equally—that one or the other must drag on the ground and that undesirable wear will result. To overcome this difficulty some device must be adopted. In electric vehicles it is overcome by having a sepa-



"American" Runabout—American electric vehicle.

rate motor to drive each of the two wheels. In steam and gasoline driven vehicles the most common device is that which is known as the compensating gear. It will serve the present purpose to merely say that this device may be attached to an axle and that driving power will be transmitted through it to the axle and thence to the two wheels (both fast to a revolving axle, unlike that of the common carriage but like that of a railroad car) and, at the same time, permit their contact with the ground to regulate the exact proportion of power that each shall absorb. Where this compensating gear is used the power is transmitted to the casing which encloses the gear. Other devices than the compensating gear have been used and the compensating gear is sometimes placed elsewhere than on the axle of the driving wheels but no horseless carriage is practical without provision for a proper distribution of speed and power to the driving wheel.

It is also necessary that provision be made for permitting all four of the wheels of an automobile to be in simultaneous contact with the road despite inequalities in the latter, owing to the necessity for carrying, undamaged, storage batteries, engines, boiler or whatever devices are provided for furnishing the power, and all without unduly straining



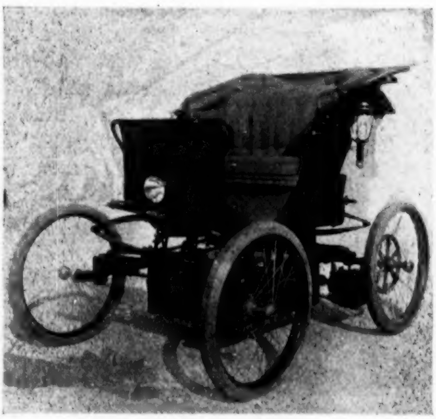
Columbia Four Passenger Trap—American electric vehicle.

the vehicle or unduly tipping the carriage body. This result is accomplished in such a variety of manners that it would be fruitless to attempt to describe them here. That the result must be accomplished remains an undisputed fact, except when only three wheels are used, as in sometimes done, in which cases this difficulty does not exist. For the same reason the vehicle must be provided with adequate springs, in addition to the solid rubber, cushion or pneumatic tires which are usually used, and this is a big problem in itself. The pneumatic tire question is considered under the discussion of electric vehicles, as it applies with more force to the electric than the other types.

Steering Devices

Providing suitable steering devices is another problem. The necessity of carrying the motive power and the consequent necessity of utilizing all the space in the

body of the vehicle complicated the problem. It will take but little thought to show the impracticability of turning the entire axle of the vehicles, as in horse drawn carriages. To obtain the best results it was found advisable to set the steering wheels loose on the axle in the usual manner, to have the central, main portion of the axle rigidly attached to the running gear and to have hinged joints near either extremity of the axle to permit the wheels to be turned in either direction at any desired angle. This must be done and the steering must be accomplished from the seat in a convenient manner. All this requires merely mechanical ingenuity but requires it in a highly refined form. Results have been accomplished in such a variety of ways



Eaton Carriage—American electric vehicle.

that it would be idle to attempt to even recapitulate. But again the results must be satisfactorily accomplished.

Owing to the high speeds at which automobiles can be driven it is not only desirable but imperative that they be provided with efficient brakes, else accidents are bound to occur. Sometimes two and occasionally three methods of bringing the vehicle to a quick stop are provided. The provision of brakes is comparatively a simple matter but, again, they must be provided.

Simplicity Very Desirable

There remains one more thing that is highly desirable in an automobile, besides those things that the purchaser can best decide for himself without advice and besides the provision for motive power and its application. That is simplicity in management. It is a foregone conclusion that a vehicle that must furnish its own power and must be started, stopped, braked, run at various speeds and reversed, and must, at the same time, be steered, requires the operation of a number of more or less complicated mechanical devices. The task that is here set the inventor is to combine the operation of these devices into as few wheels, levers or whatever contrivances he uses, as possible. That this is not a too difficult task is proven by the fact that one inventor has compassed all these operations in one simple hand lever, and a foot brake.

Construction is Difficult

The reader will probably understand by this time that the construction of an automobile is a task requiring the aid of mechanical genius of a high grade, even if the construction of the running gear of the vehicle were the only problem involved. He will understand that in purchasing an automobile, unless he is financially prepared to pay for experimental vehicles and those of inferior mechanical construction, he must give the subject serious consideration. But the construction of the entire running gear is a simple matter compared with the provision of the motor power, the consideration of which is next in order.

In an experimental way, carbonic acid gas, compressed air, liquid air and other forms of condensed energy have been applied to motor vehicles but up to the present time no results have been accomplished by their aid that are interesting to the general public. In other words no safe, economical practical vehicles have been made that are propelled by those agencies.

The Successful Agencies

The agencies that have been successfully used to produce the motive power for automobiles are electricity, steam and the products of petroleum (hydrocarbons). Electricity is utilized through the use of storage batteries in which electricity is stored and used as may be needed by motors which drive the vehicle. Steam

is used in the good old fashioned way, produced in a boiler by the burning of fuel beneath it and conveyed to the cylinder of a steam engine (identical in principle with the common forms of steam engines). Hydrocarbon oils are used in what are commonly known as gas or gasoline (explosive) engines. There are a

Woods' Cab—American electric vehicle.

few exceptions to these generalizations, but what has been said is substantially accurate.

ABOUT ELECTRIC VEHICLES

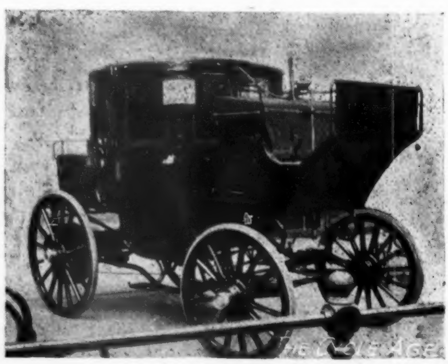
At the first blush it would appear, to any one who has seen a motor man drive a trolley car at all speeds, from a crawl up to twenty-five or thirty miles an hour and always have it under control, that stored electricity (storage batteries) would furnish the ideal power for automobiles. It would seem that a vehicle, deriving its power from a storage battery which it carried itself, would be able to do, on common roads, all that a street car deriving its power from a trolley wire, is able to do on a steel track. The idea is wrong. In many ways electricity is the ideal agency to drive motor vehicles, but storage batteries are hedged about by so many restrictions that they have many disadvantages.

Advantages and Disadvantages

The advantages of electrically driven motor vehicles are simplicity, and variation of speed, forward or backward, up to a maximum sufficiently high for all practical purposes, noiseless running, and absence of odors, vibration and visible exhausts. The disadvantages are the first cost, the cost of running, deterioration of batteries, liability of batteries to be damaged, limited area of travel, dependence on charging stations to replenish power, the time necessary to recharge batteries, inability to travel over very rough roads or streets or up steep grades, comparatively heavy weight and a number of disadvantages arising from the weight.

Faults of Storage Batteries

All these disadvantages may be laid at the door of the storage battery. Convenient a thing as the storage battery is, it is not perfection. Lead and other heavy materials enter into the makeup of all types of storage batteries and consequently they add great weight to the vehicles to which they are attached. Motors, too, are heavy. The weight of motors and batteries necessitate a heavy construction in the vehicles to which they are attached. In a general way, it may be said that a battery furnishing sufficient power for a vehicle designed to carry two persons is at least 600 pounds and that the complete vehicle, exclusive of passengers, weighs from 1,200 to 1,800 pounds. Let us say that it takes 1,500 pounds of vehicle to carry 300 pounds of passengers, and we have a ratio of five to one. This weight is not so much of a disadvantage in itself, although it is by no means de-



Riker Brougham—American electric vehicle.

sirable, but it leads to other and more serious disadvantages.

This weight makes the cost of operating the vehicle high as compared with other self propelled vehicles because of

the amount of energy that must be expended. This is one of the least of the faults of the electric automobile, however, for, although the cost is comparatively high it is not actually so, being somewhere in the neighborhood of two cents a mile for two passengers, and less in proportion for more passengers. For people to whom the first cost of an electric carriage (from $900.00 up) is not a prohibition, the operating cost will be a small drawback.

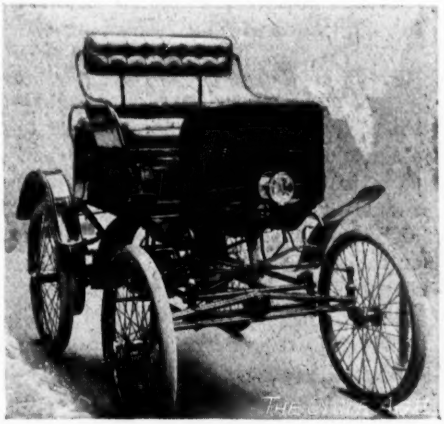
Disadvantages of Weight

The weight, however, makes the electric vehicle less durable than vehicles of lighter construction. It must be remembered that in automobiles, the wheels (usually two of them) perform not only the function of carrying the load, the same as the horse drawn carriage, but also drive the vehicle, through their contact with the ground. It will be readily understood that this double work is hard on the wheels. It has been found by experience that wheels of ordinary construction will not stand this work. Experiments have remedied this evil to a great extent but it may safely be said that no even approximately perfect wheel has yet been proven to exist. Pneumatic tires are desirable on automobiles, both for the purpose of giving comfort to the occupants and to add life to the vehicle itself. The high pressure to which the tires must be inflated and the other strains to which they are subjected are hard on them and shorten their usefulness—and pneumatic vehicle tires cost from $30 to $100 a set of four. Neither have the ordinary styles of wooden wheels or the suspension (bicycle style) of wheels been found to answer all purposes of durability. For the lighter types of vehicles, however, the matter of wheel construction has reached such a point as to make it a not insurmountable bug-a-bear. The owner of an electric automobile must, nevertheless, be prepared for more or less trouble with the wheels of his vehicle. This also applies to the wheels of steam and gasoline vehicles, but in a far smaller degree.

What has been said in reference to the weight of the vehicle shortening the life of its wheels is also applicable to other parts—much less forcibly, however.

Effects of Bad Roads

Weight, again, accounts (although only in part) for the inability of automobiles to travel over rough ground and up stiff grades. The reader will understand that to do either requires added expenditure of power. There is no mechanical difficulty in providing a vehicle with a



Waverley Runabout—American electric vehicle.

storage battery and motor which will furnish any given amount of power, but the weight of battery and motors is so much increased that they add but little to the efficiency of the vehicle for overcoming obstacles. Let us suppose an electric trap weighs 1,500 pounds and its two passengers 300 pounds. Then the battery and motors must propel 1,800 pounds. Now let us assume that a battery twice as heavy and furnishing twice as much power, with suitable motors is attached to another two-passenger vehicle. Then the second vehicle will of necessity weigh at least 2,500 pounds or 2,800 pounds with the passengers. Let us assume that the first vehicle has two effective horse power and the second four. A little figuring will show that the gain in efficiency for overcoming obstacles has been increased only a little more than twenty per cent. The suppositions above favor, rather than otherwise, the electric carriage. No argument is needed to convince sensible persons that a vehicle to carry two people which would

weigh more than a ton would be a monstrosity. It may therefore be set down, as an indisputable fact that no electric carriage has been built or can be built, until there are radical improvements in storage batteries, that is capable of being driven over rough roads or up stiff grades of any great length or any frequency. The extreme illustration is seen in a French racing "torpedo" on wheels which weighs 4,000 pounds and carries only one person. it is said, however, to be capable of covering fifty miles without recharging.

Limited Area of Travel

Once more the weight of storage batteries is such that it is impracticable to fit a vehicle with one that can be depended upon to carry its passengers more than twenty-five or thirty miles before the battery is exhausted and must be recharged or exchanged for another battery that is already charged. This means that the possessor of an electric rig is limited to going not more than fifteen miles away from home to be sure of being able to get back. When he does get back he is obliged to allow at least three hours to elapse for the battery to be recharged. Three hours of charging, in other words, furnishes enough power to propel the vehicle for three hours at ten miles an hour on smooth, level roads or streets. The weight of the batteries is such that it is hardly practical to change one battery for another except at a station regularly equipped for such work, such as the barns of the public cabs in some of the largest cities. If the driver of an electric vehicle gets more than fifteen miles from home he will find it necessary to either submit to the humiliation of having his self propelled carriage dragged back by a team of horses or else find a power house and spend three hours to have his battery recharged. An ordinary electric lighting plant is capable of furnishing power for recharging the battery.

Criticisms Not Individual

All that has been said has been said in a general way, no attempt being made to particularize in this article. It applies to the average electrical vehicle and the best will not give results very much more favorable than indicated in the foregoing. To be sure practical electrical road vehicles have shown that they could travel in excess of fifty miles, but such results have been accomplished under exceptionally favorable circumstances and do not furnish a safe criterion by which to judge the average vehicle. Moreover the results were produced by batteries, the life of which is an unknown quantity.

The life of a storage battery is the length of time that it may be used before it has so far deteriorated that it is necessary to replace it. With average careful use, a battery can not be depended on to show a period of usefulness exceeding five years and some of the batteries which have produced the best results in practice, as far as furnishing power to carry vehicles over a long distance, are of such recent invention that the question of length of life is still unanswered.

Batteries Subject to Injury

Returning to the matter of traveling over rough roads, it is stated that the consumption of power was not the only reason preventing electrical vehicles from being driven over the excessively rough roads and streets with which this country abounds. The delicate construction of the batteries enters into consideration. They will not stand too rough treatment. The largest company of storage battery makers, in its catalogue, advises its patrons not to order their complete batteries sent by freight owing to their liability of damage.

The situation was tersely put by a maker of gasoline driven vehicles who was told that a maker of electric carriages was experimenting with a certain make of battery. He said:

"Well, they will need all their big pneumatics and springs to carry those invalids around. The batteries they have been using are none too robust."

Advantages of Electrics

It must not be thought, that, because the failings of electric vehicles have been treated so much at length, electric traction for private use is without advantages. It will be remembered that those advantages were briefly mentioned before the disadvantages were touched upon. These advantages—simplicity, complete

control, variation of speed to a nicety and absence of noise, dirt, vibration, odors and exhaust—are features for which those who have built steam and gasoline driven vehicles, have labored long and hard without accomplishing all that they desire. The electric vehicle has a field of its own, as opposed to other self propelled carriages, and, in that field, has, at present no competitor.

The Ideal Carriage

What can be more ideal than for a man or a woman to be able to step into an elegant vehicle at a minute's notice, without the delay of "hitching up," and, by a mere movement of the hand, set that vehicle in motion and then be able to vary the speed up to any point which city ordinances permit, stop almost instantly, turn in half the space in which one could turn with a horse drawn vehicle, have, in short, absolute control of the carriage and all without the least noise, odor, vibration or dirt, or any of the innumerable annoyances attendant on horse propelled vehicles and other forms of self propelled vehicles? It certainly does approach the ideal. Yes, the electric carriage has a field and is at present without a competitor in that field. The status of the American electric may be summed up as follows:

Approaches Perfection

The vehicle of the present approaches more nearly perfection, within the limits of the known possibilities of the motive power used, than any other type of automobile. There have been built electric conveyances that are elegant, stylish, comfortable, and, with careful use, durable. They are made to carry two to twelve persons and are built in the various styles known to the carriage makers' craft, following very closely the familiar lines to which we are accustomed. On streets and boulevards that are fairly smooth and level, within a radius of twelve or fifteen miles and for a complete journey of twenty-five or thirty miles once every six hours, the electric performs every function demanded of it in a thoroughly satisfactory manner. It requires no attention beyond connecting the battery with the power supply when the battery is exhausted and of keeping the vehicle clean, making it possible for the economically inclined to dispense with the services of a groom without undertaking a too disagreeable or a too enormous task.

The Matter of Expense

The expense for power will amount to much less than the feed of one horse, even if used to a considerable extent. The electric, or any other automobile, does not eat except when it is at work, in which respect it sets the horse a commendable example. The deterioration of the batteries may be said to offset the deterioration of horse flesh on the average. Definite data as to the amount of repairs that may be required on the electric are not obtainable, but they will scarcely prove great, in all probability being confined almost entirely to the running gear, except in case of accidents.

(This article will be continued in succeeding numbers with a description of the construction of steam and gasoline propelled carriages.)

UNITED STATES AUTO

The accompanying illustration shows the vehicle turned out by the United States Automobile Co. The weight of the vehicle complete is about 2,200 pounds, of which the batteries weigh 1,100. It has been tested over a distance of twenty-two miles without exhausting the batteries and shows a speed maximum of fifteen miles an hour. At present the company is constructing a vehicle for the chief of the Providence fire department.

A new company for the manufacture of vehicles in quantities on the designs of the United States Atuomobile Co. is in process of formation.

The company give the following additional details of the carriage.

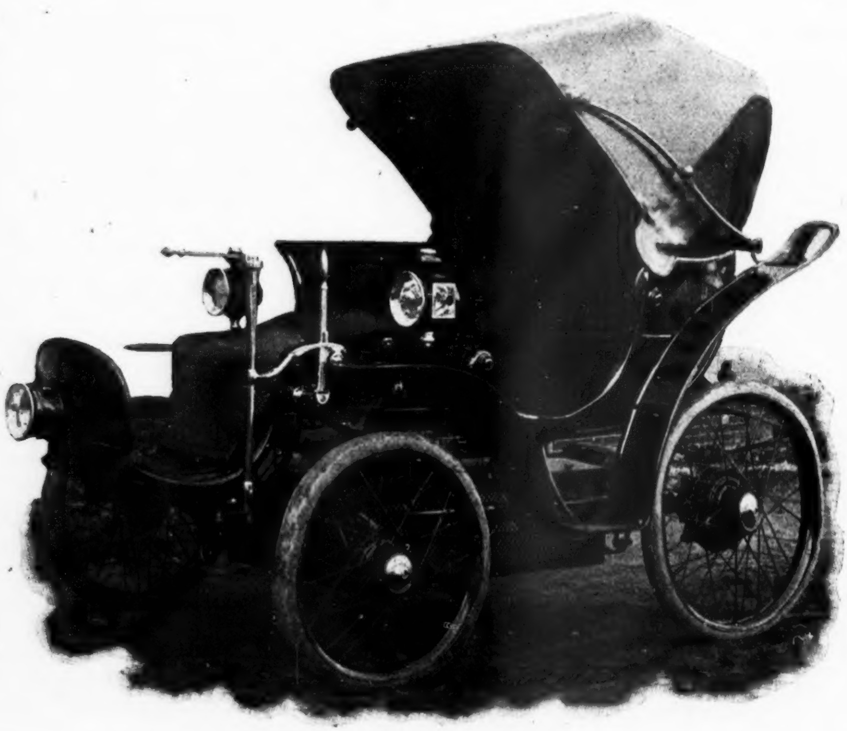
"It is provided with many new features

which are worthy of notice, one of which is a special motor manufactured by this company in which both the field and armature revolve. The field is fastened to one driving wheel and the armature to the other through means of reduction gears, thus giving the independent speed of the driving wheel without the compensating gear. Another important feature in this motor is that it weighs considerably less than any other motor now in use. A three horse power motor which is used in the vehicle shown weighs 125 lbs. The battery is suspended to the truck frame on independent springs, the carriage proper being mounted on ordinary light carriage springs. This is a feature which will be greatly appreciated by the passengers, by the easy riding of this carriage. Again the placing of the battery close to the ground gives less sideways strain on the truck than if it is placed in the carriage body which is another feature of importance.

"The steering wheel is provided with a central pivot, the steering handle being provided with a clutch which holds the wheel absolutely firm in any position in which the operator sets the steering handle. This is automatic and no attention is required from the motorman. The carriage is provided with three forward and two backward speeds, the highest speed being twelve miles per hour.

"It will be noticed in this cut that the driver's seat is placed very low which gives almost an unobstructed view to the passengers.

"The carriage is provided with a powerful band brake. It is capable of stopping the carriage in twice its length when going at full speed."



UNITED STATES ELECTRIC VEHICLE.

A CHICAGO PIONEER CONSTRUCTOR

EXPERIMENTAL WORK CARRIED ON BY EDWIN F. BROWN—DESCRIPTION OF STEAM VEHICLES CONSTRUCTED IN THE EIGHTIES—WAS AHEAD OF THE TIMES

Edwin F. Brown, Chicago's oldest cyclist and one of the early bicycle manufacturers in the West, lays claim to being one of the pioneers in the manufacture of the self-propelled vehicle, having constructed three vehicles in the years between 1884 and 1891. Each of the three machines were propelled by steam but varied in pattern. As the first two are out of existence, so far as Mr. Brown knows, but incomplete sketches are given, and these are taken from descriptions and rough sketches provided by Mr. Brown and A. W. King, another old timer, and expert in the automobile line.

Source of Inspiration

Mr. Brown first became interested in the self propelled vehicle by a number of articles which appeared in the Scientific American in 1882 and 1883. He studied them all carefully and began experimenting, the machines shown herewith being the results.

As the Scientific American dealt with steam only, all experiments were carried out with that motive power for driving purposes. Electricity and hydrocarbn motors were not taken up at that time in connection with self propelled vehicles.

Mr. Brown is still building steam tricycles for his own amusement and has, as well, a gasoline motor vehicle which for the past three years has been in continuous service, showing that the pioneer work has given him valuable knowledge as to the requirements of a practical motor vehicle.

First Experiment

Number one, was made from an old Hillman, Herbert & Cooper tandem tricycle which Mr. Brown had been using for some time prior to '84. The front seat, pedals and chain were removed and in their places were fixed the boiler and engine; the former was of the dropped tube variety while the engine had a cylinder two by three inches. It traveled, as near as can be figured, at 1,600 revolutions per minute and drove the large wheel by means of a chain made from heavy cast iron.

Trouble From Smoke

Mr. Brown states that when mounted on the rear seat and traveling in any direction at any speed, the smoke and vapor from the stack would catch the driver full in the face. The fuel at first was coke and later hard coal, but in time a change was made to gasoline, but with this fuel, trouble arose in the burner and it did not give as good results as were desired.

The illustration will explain sufficiently, the construction of the machine itself. The steering was effected by means of the old spade grip attachment, which, by means of two racks, was connected with each small wheel. This was manipulated from the seat by the right hand. The boiler was provided with water and steam gauges.

Taken all round the machine gave good service, as long as the driver cared to face the bombardment of smoke and vapor, but Mr. Brown desired an improvement and worked out the second machine, which is also illustrated. In this machine, however, four wheels were used.

Construction of Second

As in the first vehicle the boiler was placed in front of the driver and he was allowed to catch all the smoke, but the remainder of the equipment was far superior in every particular. The engine was similar to the ordinary fire engine inasmuch as the crank-pin was carried in a block, the path of the latter being from end to end of a transverse slot provided for the purpose and carried on the end of the piston rod. The action of the block was to travel from end to end of the slot as the crank revolved. The boiler was about two feet high, and stood upright; it had a stack the whole of which was handsomely ornamented with polished brass. The body of the boiler was covered with wood over a heavy coating of

asbestos, the whole being bound with brass. Water and steam gauges were provided as on the first machine.

Other Structural Details

The driving was effected by means of a heavy chain, the connection being made

EDWIN F. BROWN.

from the engine crank shaft to the driving wheel on the right side of the machine. The front wheels were placed on an ordinary axle like a horse driven rig and were controlled by means of a spade handle as on the first machine, except that the spade grip was located near the operator and from it there led a rod, the front end of which was attached to a projecting arm on the king pin, or as it was in this machine, a head stem leading from the axle similar to that used in a bicycle fork. A fifth wheel was used. To make this possible a goose neck of heavy tube was formed which was parallel to the tires of the front wheels. This made the appearance from the side more attractive.

Steering Defective

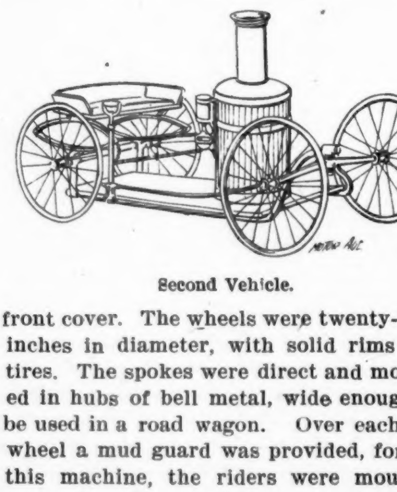
Taken all in all the machine was a great advance on the first one, but failed on one important point and that was its steering. The wheels being mounted in the ordinary way and swung from the center, the smallest obstruction met with in the road would cause the shock to be transmitted to the hand and arm of the operator until, in a short time, numbness would set in. For this reason it was found advisable to change it, but as a buyer came upon the scene who was satisfied to take it as it was, the machine was turned over to him and when last heard of was doing duty somewhere in Kansas.

Third Vehicle

The third and most satisfactory of the number, was propelled by steam, the same as the others, but in this case a double cylinder engine was used and connected direct to the rear axle. At the time there were no differential gears to be had, so Mr. Brown adopted, what served the purpose at the time, a set of clutches taken from an old Star bicycle. These clutches were the most simple of any then made. hence their adoption. In respect to these clutches, Mr. Brown states they gave no trouble and acted effectively at all times. As long as the machine was being run in a straight line both clutches operated, but as soon as one wheel traveled faster than the other, as in traveling around a corner, the driving power was transmitted through the slow wheel. This was altogether wrong, but could not be avoided.

Made From Bicycle Parts

The frame was composed of parts of an ordinary bicycle, in combination with a few additional struts and braces, which took the form shown in the sketch on



Second Vehicle.

front cover. The wheels were twenty-four inches in diameter, with solid rims and tires. The spokes were direct and mounted in hubs of bell metal, wide enough to be used in a road wagon. Over each rear wheel a mud guard was provided, for, on this machine, the riders were mounted

over each rear wheel, a seat being arranged as shown in the illustration.

In construction the boiler was somewhat similar to the one used in the first machine, being patterned after the dropped tube fire engine boiler then used. It had 100 copper tubes, ½ by 12 inches. A common bean blower was used on the inside of each tube to serve as a distributor, a fantail being formed on the bottom of each.

Again Tried Gasoline

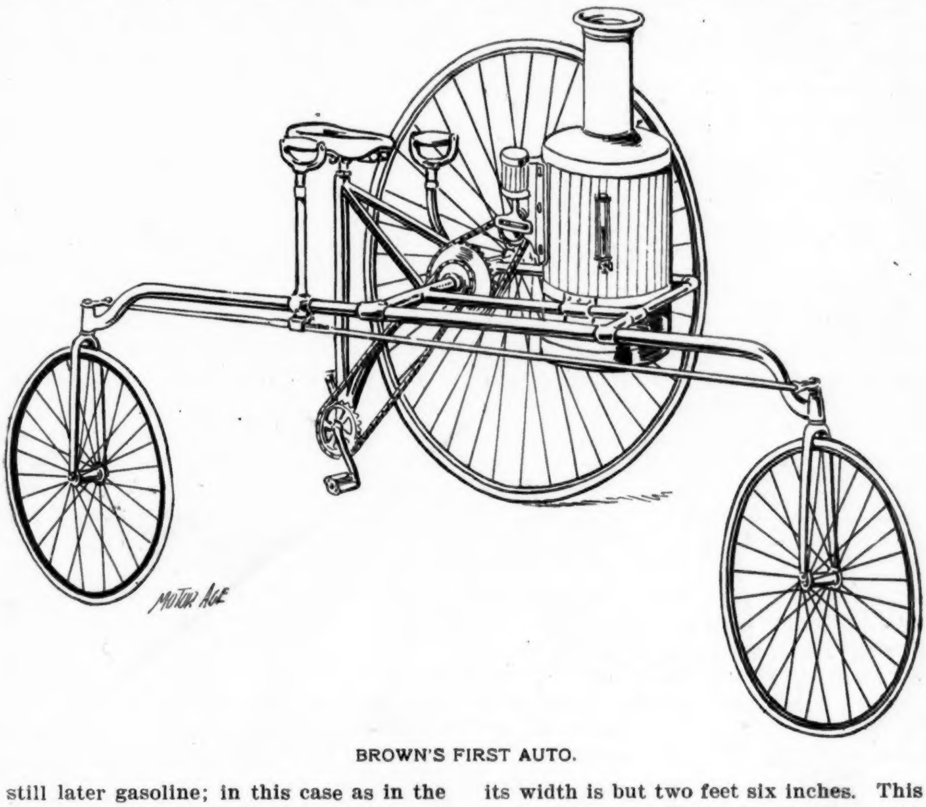
The fuel first used was coke but after giving it a good trial, coal was tried, and still later gasoline; in this case as in the former one, the burner give trouble. It proved that gasoline was to be the fuel for this class of vehicle, however, and Mr. Brown kept on experimenting. He provided for a supply of about six quarts of oil and to feed the oil to the boiler in a regular manner provided a hand pump at one end of the tank by means of which he could keep the tank full of air under pressure. In this way the supply of oil was made more regular.

The water supply of the boiler was governed by a pump which acted whenever the vehicle was moved forward. At times when the water would reach the desired height and the machine was still running, a by-pass would allow it to go back to the water tank again. The tank is shown in front of the boiler. This tank carried approximately five gallons of water.

Had Modern Features

The running gear was mounted on ball bearings. Another point which seems strange to have been incorporated in a vehicle of such early construction, is that its width is but two feet six inches. This was made for passing in and out ordinary three-foot doors. The wheel base was three feet; this part of the construction was found to be a mistake and in the reconstruction will be remedied. The steering was done by a handle that when not in use dropped down in a vertical position. It was semi-circular in shape and could be used by either rider.

Now that Mr. Brown has had further experience in the construction of the self-



BROWN'S FIRST AUTO.

propelled vehicle, having constructed two or more gasoline rigs of late years, he intends reconstructing the old steam tricycle for his own pleasure. The improvements to be made number among them the following: Wheel base to be lengthened at least ten inches; new tubular boiler (copper) in which 325 ½-inch tubes will be used. A gasoline burner will be added, but in this case the burner will be of some standard make that has proven itself capable of doing its work in a thorough manner. The front wheel will be made thirty-two inches in diameter, while the rear will be twenty-four as at present, but all will be fitted with pneumatic tires suitable for heavy road use. In each wheel tangent spokes will replace the direct ones. The boiler will work under 120 pounds pressure and will be provided with all the automatic arrangements to be found for the purpose of governing the water and fuel supply.

High Speed Obtained

All these things Mr. Brown has figured on and expects to have a machine in a short while that will out run anything on the boulevards of Chicago. With the old tricycle as it stands, a speed of twenty-two miles an hour has been obtained for a short space of time, but as the boiler was not capable of keeping up the pressure for any length of time, that speed could not be maintained. With its new equipment, however, Mr. Brown thinks he will be able to get more than thirty miles an hour from it on a good road.

It will be dealt with in these columns at a later period, after it has been completed and tried.

A SELF STARTING MOTOR

The Autocar of London has an extended account of an ingenious gasoline motor, the invention of the Messrs. Dawson of Canterbury. After a long eulogy of the motor which reads as if it were inspired, the editor gives the mechanical description which is here reproduced with the accompanying drawings.

The motor is designed to be self starting and to furnish augmented power when needed to the extent of fifty per cent above the normal power of the engine. The former is accomplished by storing a chamber with a supply of compressed air, which, the article claims, can be kept stored under pressure for an indefinite period. The compressed air is obtained by the agency of an auxiliary annular chamber in the elongated cylinder of the engine and is accumulated when the engine is called upon to furnish less than its normal power.

The increased power is obtained by scavenging the explosion chamber of the engine with a supply of air pumped by the before mentioned auxiliary annular chamber. The explosion chamber is thus cleared of burned gases which are replaced by fresh air and an additional supply of gasoline vapor is admitted, so that there is, at the moment of explosion, not only a larger supply of combustible mixture, but it is under higher compression. The editor of the Autocar claims to have witnessed a successful test of the engine, which, in practice, is composed of three cylinders with the cranks of the motor shaft set at 120 degrees so that there are no dead centers.

The following from the paper will explain the workings of the engine:

"Figure 1 is an end elevation, the part shown in section constituting the chief difference in construction between this motor and the usual types of spirit motors using the "Otto" cycle. The remainder of the drawing is merely an outside elevation, for what may be termed the foundation of the motor differs but little from current practice. Figures 2, 3 and 4 show three positions of the special valve arrangement.

"In fig. 1, 1 is the water-jacket combustion cylinder working normally on the Otto cycle, 2 the compression chamber and valve box, 3 the usual automatic admission valve easily removable for inspection and to get at, 4 the exhaust

valve, 5 sparking plug. Exhaust valve 4 is operated in the usual way by cam on half-speed shaft and pusher 6. This shaft carries at its outer end a readily remov-

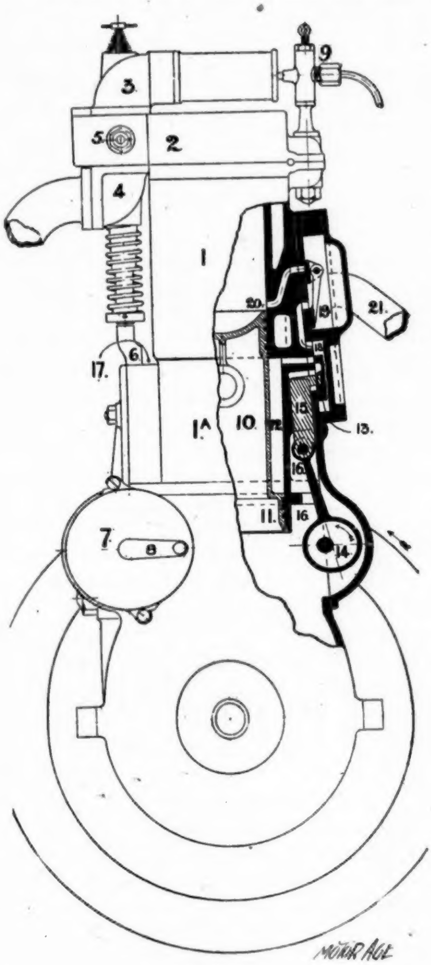


Fig. 1.

able case 7, enclosing the contact breaker (and distributer, if more than one cylinder be employed) and timing lever 8. Gasoline feed by a special pump (not shown) is actuated by governor, delivering (through regulating device 9 if more than one cylinder) into passage communicating with 3, and forming carburetter.

"Coming now to the starting arrangements, the combustion cylinder 1 opens out at its lower end into a second cylinder 1A about 1.6 times greater area than 1. The piston 10 has also a large end 11 fitting 1A, and thereby forming an annular space 12, which constitutes the air cylinder. This is, in fact, an independent single-acting air engine having a port which opens from 12 into the slide-valve box and slide valve 13. This valve is driven by an eccentric 14, the eccentric having a simple reversing gear specially designed to suit the requirements of the motor (not shown), actuating 13 through a slide bar 15, working in what would be the exhaust passage in an ordinary air engine, and doing away with glands, etc. Passage 16 communicates with crank chamber, and thence with the open air at 17. Slide-valve box communicates by port 18 with another box 19, into which also opens the "augmenting port" 20 (communicating with cylinder 1 at end of each outstroke of piston 10) and the air main 21 leading to reservoir.

"The model of working may be seen by reference to figs. 2, 3 and 4. Ports 18 and 20 are covered by two valves 22 and 23,

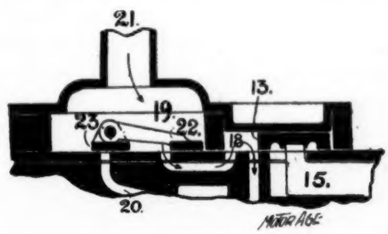


Fig. 2.

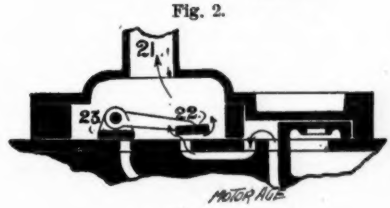


Fig. 3.

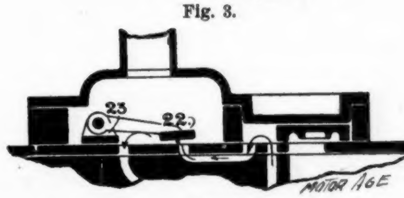


Fig. 4.

connected flexibly together, and capable of being drawn across their seats by a hand lever (not shown). The air reservoir has a combined automatic non-return valve and starting valve, which may

be lifted from its seat by hand. In starting the motor—assuming the air reservoir to be charged to a pressure of from thirty to sixty pounds per square inch—the valves 22 and 23 are placed as shown in fig. 2, uncovering port 18. Slide valve gear is set for whichever direction of starting may be required, and the reservoir starting valve is pulled open. Air under pressure at once enters box 19 from main 21, and passes through 18 into cylinder 12, thus setting motor in motion (three cylinders are coupled together in practice with cranks at 120 degrees, and hence there can be no "dead centers," and motor will start from any position). One or two revolutions suffice to bring into play the combustion end of motor when the starting valve is closed, and the motor operates in the usual manner, no other movement of valve gear, etc., being required. When it is desired to recharge the air reservoir while the motor is running, eccentric 14 is reversed, and valves 22 and 23 placed as in fig. 3. Cylinder 12 then becomes an air-compressing pump, and valve 22 its check valve, the air pumped passing through main 21 to reservoir. A safety valve (not shown) is provided to prevent an excess of pressure in reservoir. When the pressure gauge indicates the desired pressure, the eccentric 14 is returned to its normal position, and pumping action ceases. In ordinary running about five seconds suffice to return the air used at each start.

"The valves being placed in position, fig. 2, and starting valve pulled open (while running), the air cylinder 12 acts as an air brake, capable of very powerfully retarding the motor.

"To increase the power at will, valves 22 and 23 are set at fig. 4, and slide valve set to pump (by reversing gear). Port 20 is then uncovered, and at end of each outstroke of piston 10 a blast of air pumped by 12 passes into 1. This has the effect of scavenging out the exhaust products on the completion of explosion stroke, and opening of valve 4, and on completion of suction stroke drawing in the normal Otto charge, of injecting a further quantity of fresh air into a charge already much purer than when working on the Otto cycle. The addition of air alone in this way—raising, as it does, the compression from the normal 80 to 120 or 130 pounds per square inch—enables as much as twenty per cent. increase of power to be obtained, and the addition of more gasoline feed at 9 considerably further increases the power obtainable, Mr. Dawson having obtained in brake tests by this means no less than twelve and a half horse-power from his nominal six horse-power model, which, using the normal mixture alone, develops eight horse-power, so that it will be seen he is able by this action to increase the power of his motor at will by fifty per cent. at least, and he is very hopeful of getting even better results."

It would seem quite possible for the inventor to continue his improvements to the point where the explosion chamber would regularly be scavenged, this adding to the regular efficiency of the engine, and to furnish additional power for emergencies through his reserve supply of compressed air, thus making a lighter engine for the horse power developed.

Despite the "inspired" tone of the article, it is apparent that the engine comprises the working out of valuable ideas. It will be of interest to note its future progress under road test.

WHERE THEORY OR PROMISE PREVAILS

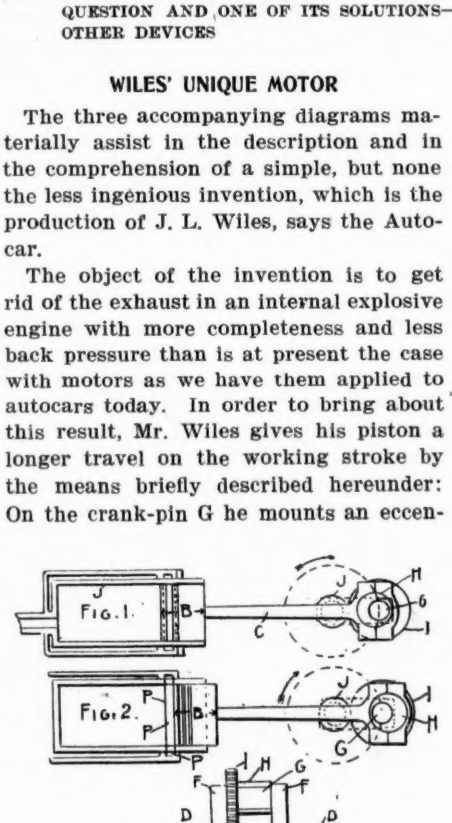
PROBLEMS WORKED OUT

WILES' MOTOR WHICH EXPELS PRACTICALL ALL BURNED GASES—THE ROLLER BEARING QUESTION AND ONE OF ITS SOLUTIONS—AN APPARENTLY PRACTICAL VEHICLE TIRE—OTHER DEVICES

WILES' UNIQUE MOTOR

The three accompanying diagrams materially assist in the description and in the comprehension of a simple, but none the less ingenious invention, which is the production of J. L. Wiles, says the Autocar.

The object of the invention is to get rid of the exhaust in an internal explosive engine with more completeness and less back pressure than is at present the case with motors as we have them applied to autocars today. In order to bring about this result, Mr. Wiles gives his piston a longer travel on the working stroke by the means briefly described hereunder: On the crank-pin G he mounts an eccentric sleeve H, upon one end of which is carried a toothed wheel I engaging with the pinion J fast on the shaft K. The toothed wheel I is twice the diameter of the pinion J, so that the eccentric sleeve on the crank-pin is rotated once in every two revolutions of the crank-shaft. The connecting rod bearings are on the surface of this eccentric sleeve, and not upon the crank-pin. The openings P P shown in figs. 1 and 2 are the exhaust ports. In fig. 1 the piston B is shown at the end of its travel in the charging stroke, the major radius of the eccentric sleeve pointing directly inwards, and thus preventing the piston from uncovering the exhaust ports P P. In fig. 2 the piston has returned up, the cylinder compressing, and is there back again at the completion of the impulse stroke. It will be seen that the eccentric sleeve has made half a revolution, and now has its major radius pointing outwards, thus allowing the piston a sufficiently increased travel towards the open end of the cylinder to clear the exhaust ports P P, and thus allow the products of combustion to escape with the utmost freedom. To eliminate back pressure altogether, a small exhaust valve could be fitted and actuated as at present. The invention still awaits practical trial.



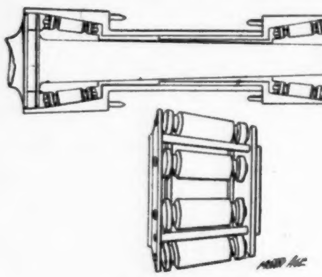
Motor Age Fig. 3.

A CONICAL ROLLER BEARING

Among the many axle bearings that have been devised for vehicles during the past few years, is one manufactured by the Timken Roller Bearing Axle Co. of St. Louis, who have two patents on the bearing shown in the accompanying illustration.

The bearing is of conical construction allowing for adjustment to take up wear, and the rollers are carried in a cage which separates them and maintains them at equal distances from each other. By reference to the illustration, it will be seen that the rollers are provided with grooves into which project corresponding ribs from the cones, while the cups have plain conical surfaces, so that the rollers and cones are maintained in the same relative positions throughout all degrees of adjustment. The end thrust, which is a feature which must be taken into consideration in all roller bearings, is taken up in part by the beveled edges of the ribs on the cones and the corresponding

grooves in the rollers, and, in part, by the transverse thrust on the rollers, which are mathematically constructed so that an arc of a circle struck from the imaginary apex of the conical surfaces of the bearing would intersect the center of the rollers on either side of the hub and the point of transverse resistance at the rim of the wheel. Without the ribs and grooves the



Timken Bearing.

most careful mathematical precision in construction would not eliminate the feature of end thrust but it doubtless relieves the ribs from a large percentage of the strain that would otherwise be imposed on them and reduces the item of friction considerably.

There is, however, no provision for relieving the friction of the rollers at their bearing points in the cages, incident to the predisposition of the rollers to assume position at an angle from that at which they are normally held, nor is there any provision for overcoming the sliding friction due to the greater diameter of the bearing surfaces of the cups than the bearing surfaces of the cones, in which respect, however, this bearing is not inferior to other roller bearings or to almost all ball bearings.

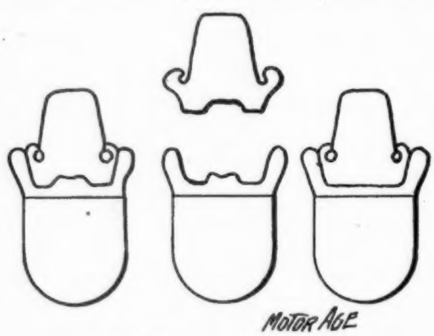
The makers of the Timken bearing erroneously claim that the use of oil in their bearing is necessary only to prevent rust. As a matter of fact, a roller bearing of this, or any other type on the market, would run harder under a heavy load, if it were not lubricated, than a well greased plain bearing. The amount of lubrication, however, is far less than in plain bearings and the assertion that the bearing will run well for six months on one application of oil, does not seem unreasonable.

In theory it is possible to design a ball in which all friction except rolling friction is eliminated and in a roller bearing it is similarly possible to design a bearing in which all but rolling friction is eliminated save that incident to the end thrust. In practice such results are seldom even approximately reached. The best bearing is the one which shows, under practical tests, long life and ease of running. When it is considered that the very great majority of vehicle axles are provided with no provision for reducing friction save the time honored axle grease, it will be seen that the introduction of roller and ball bearings is a great step in the march of vehicle construction. As these devices have been in use for only a few years it is reasonable to look for further improvements.

A PRACTICAL TIRE PATENT

Nos. 636,930 and 636,031, to John M. Sweet, Batavia, N. Y., assignor to John Richardson, trustee, same place.—Vehicle tires. The first illustrations show the latter and more simple of the two tires. The one claim sufficiently explains the principles on which the patent was granted:

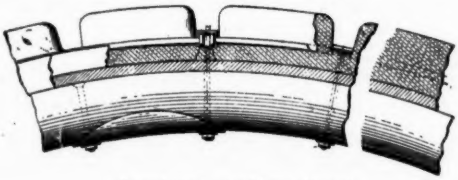
"The combination with a channeled wheel-rim having inwardly-converging beveled sides, of a solid elastic rim composed of a base portion which is seated



Two Forms of Sweet Tire.

between the beveled sides of the channel and a tread portion which is narrower than the base portion, said tire being provided on each side, at the junction of the base portion and tread, with a circumferential groove which is located within the sides of the wheel-rim and with a circumferential lip which projects from the base portion outwardly beyond said groove, and which, when unrestrain-

ed, projects laterally beyond the side of the channel, and fastening wires or rods which are arranged in said grooves be-



Sweet Tire—Sectional Tread.

hind said lips and which are covered by the outer portions of said lips when the base portion of the tire and its lips have been drawn into the channeled rim, substantially as set forth."

The other Sweet patent covers a tire of the same general principles as the one just shown except that the tread is divided into sections as shown in the second illustration. The four claims cover this construction, the same method of fastening as already described and transverse clamping-plates bearing upon the fastening wires, arranged in the spaces between the tread projections.

A CENTURY FOR AN ELECTRIC

Philadelphia, Nov. 27.—A few days ago there was given a public test of an electric motor over South Jersey's smooth roads that will go far toward removing the widespread doubt of the ability of electrically driven vehicles to cover more than a comparatively short distance without recharging its batteries. The record run for a single charging, it is said, was that made by Comte Chasseloup Loubat in France, last summer, when eighty-five miles were covered with a single charge. In last Friday's trial a trifle over 100 miles were negotiated in seven hours and forty-four minutes, including rests and stops, which aggregated fully twenty minutes, and the electricians in charge—Messrs. Justus B. Entz, engineer of the Electric Storage Battery Company, and Hiram Percy Maxim, engineer of the Columbia and Electric Vehicle Company—estimated that power to run the vehicle at least ten miles farther still remained in the batteries. During the trial a speed of twenty miles an hour was attained at times.

The vehicle was an ordinary runabout, and weighed complete about 2,200 pounds, of which about 1,000 pounds represented the weight of the batteries. With the two passengers the total weight was a trifle over 2,500 pounds.

The day was cold and raw, with a nasty east wind, and the road somewhat heavy as a result of recent rains, so that the conditions were not of the best. The start was made from the Windsor Hotel, Atlantic City, at precisely 8:30 a. m., the batteries having been charged to the limit from the electric light plant at the hotel. The route through Pleasantville, Absecon, Egg Harbor, Hammonton, and Berlin—the famous "Atlantic City route"—was selected, and at a point six miles west of Berlin, when fifty miles had been completed, the machine was turned around, and the homeward journey began in the teeth of a stiff easterly breeze. The half century was completed at 11:49—three hours and nineteen minutes, including stops. The last fifty miles were covered in four hours and twenty-five minutes, including stops for lunch, the starting point being reached at 4:14. It had been the intention of Messrs. Entz and Maxim to work the motor until the batteries gave out, but as both men were chilled to the marrow after their long ride they concluded to abandon the test at the conclusion of the century—which is much to be regretted, as the object of the trial primarily was to arrive at the exact traveling radius of the batteries with but one charging. Half speed had to be maintained over the first and last five miles of the journey owing to the narrowness of the roads and the comparatively heavy traffic, but as speed was not the object aimed for, this cuts but little figure in the result.

In previous unofficial trials, when the automobile was run from Philadelphia

to Atlantic City and to various resorts near the latter place, a total distance of ninety-six miles was covered, with batteries not yet exhausted.

The trial was hedged about with all the precautions to secure absolute correctness which attend a bicycle road trial, timers being stationed at the start, midway and at the outer turn; checkers were also provided at various points en route. The timers were A. C. Poffenburger, Henry Fitton, and Joseph Goodman. Many newspaper men were present at Atlantic City during the trial.

MINOR MENTION

BROOKLYN GETS A CHANCE

Postmaster Wilson of Brooklyn was greatly exercised when he learned, that, after all the energy he had expended in gathering statistics regarding the utility of the auto as applied to the uses of the United States postal service in general and the uses of Brooklyn in particular, he learned that the Washington authorities had decided to carry on experiments with the horseless wagon in Chicago—and this, despite the fact which he had taken no pains to conceal, that he had a grievance against the Brooklyn Rapid Transit Co. which has been carrying mails in that city. He no sooner got the news than he hied himself to Washington where he unburdened himself in, it is understood, a very forcible manner. As a result the auto is to have a chance in the mail service in Brooklyn as well as in Chicago and Buffalo.

CANADIAN STAGE LINE

News comes from Vancouver, N. B., of a projected stage line from Ashcroft, a place which has attained celebrity as an outfitting point for Klondikers on the all Canadian route to the Yukon, to the towns of upper Cariboo. It is reported that the stages will be built at a Vancouver factory and that $5,000 is now being spent on the construction of the first one. It is to have accommodations for twelve persons and half a ton of baggage. It will have steam as the motive power.

CANADIAN BRANCH TRUST

From Toronto comes word that the National Cycle & Automobile Co. has completed organization, elected directors and made arrangements for launching its business. The corporation will have a capital stock of $2,500,000, and will control in Canada the business and patents of the American Bicycle Co., as well as some Canadian concerns. The directors elected are Fred S. Evans, Windsor, Ont., president and managing director; A. A. Pope, Boston, and A. G. Spalding, New York, vice-presidents; H. L. Garford, New York; E. C. Stearns, Syracuse; Lemuel H. Foster, Detroit, and T. P. Coffee and A. R. Creelman, Toronto. The company will build a large factory at Toronto.

AUTO AND BICYCLE EXHIBIT

The automobile and bicycle show which is scheduled for the week of January 20 in Madison Square, New York, bids fair to be a great success, quite as great with its combination of autos, cycles and parts and accessories for both, as the great bicycle exhibitions of the palmy days of cycling. The action of the American Bicycle Co., the trust, in having its several divisions exhibit, insures a representative field of cycle exhibits and the number of auto makers that have already entered shows that there will be a plentiful scattering of horseless vehicles, doubtless the largest number ever shown.

At present, the promoters say, there remain less than 150 spaces untaken. Among the firms having contracted for space are the following:

United States Motor Vehicle Co., Indiana Bicycle Co., International Automobile & Vehicle Tire Co., R. H. Wolff & Co., Black Mfg. Co., Buffalo Cycle Mfg. Co., A. Featherstone & Co., Sterling Cycle Works, Western Wheel Works, Crawford Mfg. Co., Ames & Frost Co., Nuttall Mfg. Co., Lamb Mfg. Co., Viking Mfg. Co., H. A. Lozier & Co.,

E. C. Stearns & Co., Barnes Cycle Co., Syracuse Cycle Co., Acme Mfg. Co., Pope Mfg. Co., Monarch Cycle Co., Stover Mfg. Co., Gormully & Jeffery Mfg. Co., Shelby Cycle Mfg. Co., Grand Rapids Cycle Co., Fay Mfg. Co., Fanning Cycle Co., Geneva Cycle Co., A. D. Meiselbach Co., Columbus Bicycle Co., No. Buffalo Wheel Co., Milwaukee Mfg. Co., Milwaukee Engineering Co., Empire Rubber Mfg. Co., American-Dunlop Tire Co., B. F. Goodrich Co., Jos. Dixon Crucible Co., Manhattan Storage Co., Veeder Mfg. Co., New York Sporting Goods Co., Straus Tire Co., G. W. Cole & Co., Gleason-Peters Air Pump Co., Manhattan Brass Co., F. A. Brecher & Co., Badger Brass Mfg. Co., American Saddle Co., C. J. Smith, Sons & Co., George L. Thompson Co., Cleveland Ball & Pedal Co., Indianapolis Chain & Stamping Co., National India Rubber Co. and the Spinroller Co.

A VEHICLE TIRE COMBINE

New York, Nov. 24.—The absorption of the New England Rubber Tire Wheel Co. by the International Automobile & Vehicle Tire Co. has been accomplished. The latter company, by the transaction, acquires, in addition to its well known pneumatic tires, the patents on the very practical solid tire manufactured by the New England company. This tire, it will be remembered, is rigidly held to the rim by a steel ribbon passing through the tire near its base, the ribbon being drawn tight by a bolt passing through the rim which draws a U-shaped section of the steel ribbon down on to the him.

ANOTHER COMPANY

The Philadelphia and Atlantic City Automobile Company, with an authorized capital of $100,000, has filed a certificate of incorporation in the Camden County Clerk's office. The company is empowered to "buy, sell and operate automibiles anywhere," but it is said on good authority that the real object of the company is to establish a line of omnibuses in Atlantic City.

WRONG LEVER MANIA

The automobile craze has developed a new disease named by a Philadelphia physician "wrong lever mania." There are in an automobile three levers—one to steer with, one to go fast with and the other to stop short. And the victim, the poor sufferer in this deadly crisis, forgets which is which in the matter of levers, decides to guess, and pulls, naturally, the wrong one. That is why, in an acute attack of wrong lever mania, Mrs. Herman Oelrichs, at Newport last summer, drove over a stone wall, up a flight of marble steps and through the stained glass windows of the music room of a friend. It is why Alfred Vanderbilt went swiftly in an automobile phaeton down one of the cliffs backward into the sea, and it is why Harry Lehr, in a petroleum T cart, completely demolished a greenhouse of glass. No remedy has been discovered for the disease which, though not necessarily fatal, is likely to result seriously to the victim and others.

NOTES OF INTEREST

The Colonial Automobile Co. has been organized at Portland, Me., with a capital of $500,000, of which nothing is paid in. The officers are G. A. March of Newton, Mass., president; and G. A. Dew of Melrose, Mass., treasurer.

Twenty thousand dollars has been appropriated for a track and grand stand at Vincennes, France, for the purpose of testing autos. Prizes will be offered for four classes comprising heavy trucks, cabs, victorias and "voiturettes."

The United States Express Co. has been experimenting with an auto delivery wagon in Baltimore. The results have proven so satisfactory that the company is considering the feasibility of gradually substituting autos in all places where they now use horse drawn wagons.